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COKE

THE problem propounded to the Gas Industry by Mr. P. C. Gardiner at the Institution meeting aroused the instinct for controversy latent in every human breast. Papers of this character are much to be desired, for they enliven the proceedings by the cut and thrust of debate. There are to be found in literature many arguments against argument. There is the well-remembered letter of the late Lord Fisher to *The Times* in 1919: "It's only damned fools who argue. Never contradict, never explain, never apologise. These are the secrets of a happy life." But Lord Fisher's whole career gave the lie direct to his published sentiments. There are those who are cynical about the matter, arguing only to get their point of view accepted, and who take for their behaviour the precept of Wycherley: "Bluster, splutter, question, cavil! But be sure your argument be intricate enough to confound the court." There are, too, those who regard with scorn all who disagree with them, as witness Dr. Johnson's petulant retort: "I have found you an argument; I am not obliged to find you an understanding."

Nothing in these *obiter dicta* should bear in any way on the Institution debate upon the quality and preparation of coke. There is before the Industry an issue of great importance: What should be the attitude to coke? The report on Domestic Fuel Policy by the Fuel and Power Advisory Council has been acclaimed by many as settling the issue beyond doubt. But it must not be forgotten that the official Government reaction to this report has yet to be disclosed. There has been no indication whether this report with all its implications will be accepted. If it is accepted, our course is clear—up to a point. We shall have received plain orders to go right ahead on the preparation of smokeless solid fuel so that the whole 30 or 40 million tons of bituminous coal now used for domestic purposes can be replaced by smokeless fuels—the greater part of these being sold in the form of coke or of smokeless coals. Whether it be justified or not time alone will show, but our view is that even if the Government does not implement the report immediately it may well be that it will be implemented sooner or later. Whether total gasification will become a commercial proposition is yet uncertain. Even if the Gas Research Board's process is used, it appears likely that a good deal of coke will be produced by that process, and that far more coke must be produced by other means in order to fufil the market demand which must follow any general adoption of smoke abatement as a policy. The problem raised by Mr. Gardiner is not so much whether we should concentrate more attention on the development of coke, but on what lines concentration should be directed.

The answer to that question has not yet been given decisively. Mr. Gardiner advanced arguments in favour of producing a coke suitable for the existing coal fire. This raises the Joadian question: What do you mean by a coal fire? There are ancient grates which burn bituminous coal with difficulty. There are more modern coal grates which can burn coal and coke with almost equal facility. Colonel Smith pointed out that millions of reasonably modern grates are in use and cannot well be scrapped for some years to come. If, as Mr. Gardiner declares to be the case, the Gas Industry can produce a fuel suitable for these grates, should it do so? That depends upon the economics of the problem, a subject that does not appear to have been tackled publicly in an authoritative manner. There appears to be two primary means for producing the required quality of coke. One of these is by carbonizing under such conditions that a sufficient amount, perhaps 4 to 6%, of volatiles is left in the coke. The other is to use coal of low rank and to carbonize it under normal conditions, though perhaps not at extremely high temperatures. Either way one result is the same—a lower gas yield per ton of coal carbonized. With the low rank coal, there is in addition a comparatively low yield of coke also. If volatile matter is retained in the coke, the yield is increased. On the other hand, it appears from the practical experience of gas undertakings that low temperature carbonization as such is not as attractive financially to the Gas Industry as are normal high temperature methods. Is the crux of the position the price of the low rank coal? If that is so, the sooner the Gas Industry approaches the Coal Board to see what arrangements can be made, the better. In that "triumvirate of fuel and power" spoken of with approval by Mr. Shinwell, one imagines that the purely commercial considerations of the past will find no place. The demand for fuel of every kind should be reviewed at a high level and if it appears good to those in authority that the domestic consumer should burn smokeless fuel, the Coal Board should put suitable fuels at the disposal of the manufacturers of those fuels at a suitable price. Is that Utopia? Perhaps it is, but at least it seems to be the logical way to enable British coals to be utilized in the best possible manner.

MODERN COKE APPLIANCES

IF, however, the use of low rank coal and of some form of carbonization which retains volatile matter in the coke alike prove to be impracticable, there remains only one obvious solution of our problem. That is the provision of coke-burning grates such as are now available of adequate design but in insufficient numbers. We do not doubt that the Gas Industry, which has developed gas fires from the exceedingly crude stage described by Colonel Smith to the modern pleasing and high efficiency fire of 1946, can do the same with coke grates. Technical development, indeed, has already solved the essential problem of burning normal gas coke satisfactorily in open grates specially designed for the purpose. It remains for the Gas Industry to sell these grates under such commercial conditions as will enable everyone, even the poorest of our population, to install them in the living rooms. We do not think that the Gas Industry is so deficient in sales ability and in commercial acumen as to be unable to solve these rathe intricate problems—problems which have already been solved for gas appliances. The short-term policy may be to produce coke suitable for almost any reasonable type of grate. But these grates will probably not have gas ignition, and we shall be imposing no small handicap upon ourselves if we attempt to use coke of this character in considerable quantities. While it may delay the total abolition of smoke

to do so, we should prefer to see the Industry pin its faith to new and modern coke burning appliances which can operate at high efficiency and can thus assist in offsetting the undoubtedly high price of coke. It appears that the provision of coke suitable for burning in existing coal grates can only be in the nature of a palliative and that the real long-term solution of the problem is to provide a combination of coke and grate that will be satisfactory to the user. The economics of gas production appear to demand the use of a good gas making coal carbonized at reasonably high temperatures.

The ash content of the coke is, of course, a matter of great moment, and this again is a question which must involve close co-operation between the Gas Industry and the National Coal Board. It is possible to prepare for many British coals a washed product with an ash content below 5%. In so doing there is always left behind in the refuse a greater or lesser quantity of coal of somewhat high ash content—between 10 and 20%—known as "intermediate product." The British Colliery Owners' Research Association, which is to be continued by the National Coal Board, is charged with the task of investigating washery problems, and it would seem likely that a survey of the coals which are now being washed would reveal not only the possibility of producing low-ash coal at very little additional cost, but also the possibility of obtaining an intermediate product in the form of a coal containing about 10-12% of ash. It must not be forgotten that whereas the Gas Industry may decide that it requires low ash coal for the purpose of producing the type of coke required by the domestic consumers, boilers and furnaces in which coal is burnt on grate bars require a coal containing considerably more ash. Thus there is a market for an intermediate product provided that it is not too high in ash and provided that the National Coal Board and the appliance manufacturers tackle the problem in collaboration. If a washery technique can be evolved which does not involve the discarding of coal which would otherwise be sold, we see no reason why coal containing less than 5% of ash should be greatly higher in price than any other quality of washed coal. It is significant that the Gas Research Board is proposing to conduct full-scale experiments to ascertain the economics of carbonizing really clean coal. We can regard those experiments as having a high degree of urgency because until they have been conducted it will be difficult for the Gas Industry and the Coal Board to get together on this important problem of the ash content of gas coal. Mr. Gardiner is to be congratulated on raising these issues, and we trust that they will be tackled energetically by all concerned.

Diary

Sept. 10.—B.G.C.: Meeting at Gas Industry House, 2.30 p.m.

Sept. 12.—North British Association of Gas Managers: Annual General Meeting at Rothesay.

Sept. 16.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m.; Gas Industry House.

The Annual General Meeting of the North British Association of Gas Managers will be held under the Presidency of Mr. T. S. Lockhart at Rothesay on Sept. 12. The Annual Excursion will take place on the following day, and will take the form of a Cruise. The Provost, Magistrates and Councillors of the Royal Burgh of Rothesay will accord a Civic Reception to the Members and their lady friends on the evening of Sept. 12. The Reception will be followed by a dance. On the same day, a motor tour has been arranged for the ladies. The Golf Competition will take place on Sept. 11 on the Corporation Golf Course, while the Bowling Competition will be at the Rothesay Bowling Club on the same day. On Sept. 11 there will also be a Golf Competition for ladies over the course of the Kingarth Golf Club.

Personal

Presentations to Mr. Henry Woodall

During a recent visit to the Company's Works at Odense, Denmark, the Chairman of the Danish Gas Company, Mr. Henry Woodall, was the guest of honour at a dinner held to celebrate his completion of 30 years as a member of the Board of Directors.

Besides the Directors and representatives from the Staffs at the Head Office and Works, the distinguished company included Mr. Werner, the Burgomaster of Odense and other members of the Commune, the Managing Director of Fyens Disconto Kasse, the Company's bankers, and Col. H. C. Smith, C.B.E.

Our photograph shows, left to right: Mr. A. L. Janssens (London Agent), Mr. Knud Andersen (Director), Mr. C. Edwards (General Manager and Engineer), Mr. Henry Woodall, Lt.-Col. E. C. Woodall, O.B.E. (Director) and Mr. Ernst Petersen (Vice-Chairman).

After the dinner Mr. Woodall was the recipient of three pieces of Royal Copenhagen porcelain from the Company. In making the presentation, the Vice-Chairman of the Company, Mr. Ernst Petersen, spoke of the great pleasure it gave him and his Danish colleagues to welcome the Chairman once again to Denmark after so long and painful a separation. Speaking alternatively in English and Danish, he dwelt on the great benefit the Company had derived from the wise guidance of its Chairman. His great qualities as an administrator and as an engineer were known to all. His personal charm and his thought for the happiness and well-being of his employees had earned him the esteem and affection of all, so that he, Mr. Petersen, could truly speak of him as "our beloved Chairman."

In his reply, the Chairman recalled his first visit to Denmark over 60 years ago. Ever since he had been in touch with Danish Gas Company affairs and had frequently visited Denmark, which had never seemed a foreign land to him. In welcoming the new Directors to the Board, he said that the relations between the English and Danish Directors had never been so happy and intimate as they were to-day. He went on to praise the Danes for their honourable and gallant independence during the years of occupation when they had treated the Germans with supreme contempt, and he thanked them for their appreciation of the attitude of his own country. He closed with a word of warm thanks to Mr. Petersen for presenting him on behalf of the Danish Gas Company with three beautiful examples of Royal Copenhagen porcelain which would find an honoured place in his home and constantly remind him of his many Danish friends and his many happy visits to their beautiful country.

Following the presentation of the Company's gift, the Burgomaster of Odense, on behalf of the Commune, presented Mr. Woodall with a silver tray engraved with the Odense coat of arms. In thanking the Burgomaster for his gift and the honour of his presence on this occasion, Mr. Woodall spoke of the many years of co-operation between the Commune and the Company which he hoped would extend long into the future for the benefit of the people of his historic city.

Gifts were also made by the Staffs of the Head Office and the Works, for which Mr. Woodall expressed his thanks.

* * *

Mr. J. P. MEDD, Industrial Engineer with Darlington Corporation Gas Department, has resigned to take up an appointment with the Sheffield and District Gas Company.

* * *

Mr. NORMAN MATTHEWS, Chief Technical Assistant to the Bolton Gas Department, takes up the position at the end of August to become Carbonizing Superintendent to the Wandsworth and District Gas Company.

Letters to the Editor

The First High Pressure Gas Holder

DEAR SIR,—I have read with interest Mr. Robinson's letter published in the "GAS JOURNAL" of July 17, and willingly acknowledge his pioneer work in adopting high-pressure storage.

I believe, however, that the Skipton unit was the first to be installed as a major part of the normal works storage, as distinct from an ancillary to a section of the distribution system.

There is a notable distinction here, because, while the high-pressure holder is freely accepted as complementary to high-pressure distribution, or as a means of correcting local pressure deficiencies, I believe that there still exists some doubt when it is considered as a station holder; and in this respect Skipton has given the lead in demonstrating its suitability for this purpose.

Yours faithfully,
J. MCNAIR,
Engineer and Manager.

Gas Works,
Skipton.
July 22, 1946.

Waterless Gasholders

DEAR SIR,—In your editorial of the issue of the "JOURNAL" of July 24 discussing high pressure holders and the general question of amenities, it is a little surprising that the waterless gasholder is not even mentioned.

Not that all people think alike regarding the appearance of this type of holder—some, in fact, may regard them as ugly brutes. It is, however, a fact that one of the earliest waterless holders erected in this country so aroused the admiration of an architectural authority, that he wrote a special article extolling its aesthetic qualities. Since then, in several cases the waterless type has been preferred when local amenities were an important consideration.

It is opportune that in the same issue of the "JOURNAL" there appears (page 159) a paragraph showing pretty conclusively that under actual wartime conditions of intensive bombing, the waterless holder proved itself to be no more potentially "dangerous" than the water-sealed type.

This will come as no surprise to those who sponsored the waterless holder in this country; but it may serve to counter ill-informed criticism, whilst at same time reassuring some who may have entertained genuine doubts upon the point.

Yours faithfully,
S. LANGFORD.

16, Queen Anne's Gate,
London, S.W.1.
July 25, 1946.

Nationalization—Viewpoint from Australia

Writing in the Colonial Gas Association's *Service Messenger*, the Managing Director, Mr. C. F. Broadhead, says:

"There is going on to-day a great deal of talk about the need for the nationalization of this industry and that industry, though whether or not nationalization is a really progressive step or merely the extension of a political philosophy never seems to be considered. And that there might be a wide gulf between 'nationalization' and 'political control' never receives the recognition it merits.

"The profit motive is being assailed as something malign and completely out of harmony with post-war thinking, but the warmest exponents of nationalization or political control—and we are never quite certain which they mean—have not yet been able to prove that the removal of the profit motive will make the world's goods cheaper, or the dispensers of them more efficient, or induce a higher standard of 'service' in their employees. Our war-time experience of 'control' has been that the removal of competition has had a shocking effect on the quality of goods, on the standard of efficiency of shopkeepers and on the attitude of employees to their jobs, and to the public they serve.

"The nationalization of the Gas Industry is 'in the air' though no-one has yet heard a sound reason why the Industry should be nationalized beyond that its operations are being carried on at a profit, but here again few people seem to have taken the trouble to find out for themselves whether or not there are still exorbitant profits to be made by gas companies.

"Actually, the profit to be derived from an investment in gas company shares is only a normal one, and there are no grounds for believing that under nationalization the price of gas to the consumer will be cheaper than under private enterprise. Under municipal control the profit motive is removed, yet the experience of municipal gas undertakings, as a whole, in Australia, is that they do not give more efficient service along with a cheaper price.

"The term 'public relations' through its excessive and misapplied use and also through the failure of its experts to extract more magic from the words 'public relations' than was possible by the exercise of ordinary everyday home-grown common-sense has fallen into disrepute. It is possible that the Gas Industry has never adequately publicised its activities; that it has never gone to over-much trouble to acquaint the public of what it is giving for the price it charges; of the capital investment required to give a city, say the size of Melbourne, an unfailing gas supply; or when gas company accounts have been published, of the widespread individual interest in the Company's share capital, and what the dividend rate means in terms of an actual investment.

"The mere denunciation of private enterprise by interested demagogues is not sufficient justification for its elimination, and before we agree to the destruction of something that has proved its usefulness over a long period, we must be very certain that something equally useful will be set up in its place. To date there are no guarantees forthcoming that there is anything better to take the place of private enterprise. We cannot abandon a tangible asset merely on the windy promise of some crafty demagogue, of some vague advantage in the shadowy future. The continuance of the principle of private enterprise in the distribution of gas is largely a matter of how deeply it can imprint its overwhelming advantages on the public consciousness, and that will depend, in turn, largely on the manner in which the individual members of gas company personnel, from directors to the most junior members of the most remote undertakings, tackle their jobs, and meet the people their undertakings are serving."

Mr. Therm in Jubilee Cavalcade

The Gas Light and Coke Company entered three special vehicles in the Jubilee Procession of the Motor Industry's Cavalcade on July 27, which was made up of some 450 old vehicles and some of the most modern now in use in this country. The vehicles entered by the Gas Light and Coke Company consisted of the latest 1,200 gall. spirit tank, a half-covered, dual purpose lorry for carrying chemicals, of which we give a photograph, and a platform coke lorry capable of carrying six tons of coke, a load of no less than 120 sacks. The cabs are designed to give maximum comfort and convenience to the driver, and the front screen is all glass giving the best visibility. The most striking feature, however, to anyone inspecting the vehicle are the glass panels in the lower part of the driver's cabin. These enable him to see the kerbs and also any obstructions or children in the gutter. These improvements were suggested by members of the Gas Light and Coke Company's Transport Department. All the vehicles have standard Albion chassis and have been in daily use for some time.

A Proposal to Construct a New Gas Main from Brancepeth Colliery to Darlington, a distance of about 16 miles, is being considered by Darlington Corporation. For some time the Corporation has been trying to obtain additional supplies of coke-oven gas, and Mr. F. Wilson, Engineer and Manager, has expressed the opinion that the time has now arrived to construct a duplicate main to the one already in existence.

Stockton-on-Tees Corporation Gas Manager has been authorized to prepare a scheme for the construction of a vertical retort plant with a capacity of 2,000,000 cu.ft. daily. Reporting on the proposal, the Gas Manager stated that the new plant would result in an increase in the thermal yield per ton of coal with a corresponding reduction in the amount of coal carbonized. The saving affected would partly offset the cost of interest and redemption on the capital spent.

Messrs. C. A. Parsons & Co., Ltd., Heaton, Newcastle-on-Tyne, have manufactured a gas turbine, claimed to be the first of its kind in this country. The present equipment is designed chiefly for land work, but can also be adapted for marine work. The Parsons gas turbine develops 500 b.h.p. at 6,000 r.p.m. Sir Claud Gibb, Chairman of Parsons, states that the gas turbine is not designed to replace the steam turbine, but will be complementary to the steam turbine. There was room for both, but the gas turbine was mobile and could be installed anywhere.

Aerated Burners of High Stability*—I.

By L. T. MINCHIN, B.Sc., M.Inst.Gas E.

General Principles

IN spite of the greatly increased use which is now being found for non-aerated burners, there remain a number of cases in which an aerated burner is desirable. Aerated burners have, as well as their peculiar merits, certain peculiar weaknesses also, of which the tendency towards lighting-back is perhaps the most serious. With careful attention to design, however, this tendency can be largely overcome, and in these three articles, of which this is the first, it is intended to present a survey of the lighting-back problem and to suggest ways in which it can be dealt with.

The Process of Air Entrainment

A fine jet of gas emerging from the injector nipple† is usually the only means by which air is entrained. There is still some doubt about the exact mechanism of this important process, but there is now little doubt that it is something as shown in Fig. 2 and described in the following paragraphs.

While flowing through the cylindrical channel which constitutes the injector orifice the flow is probably non-turbulent in character (1, 2), and the velocity is approximately the same at all points except immediately adjacent to the metal wall. When this stream emerges into the air it retains this flow-form for a short distance, but the friction of this fast-moving column with the surrounding air soon sets up a multitude of tiny eddies which are, of course, swept forward by the momentum of the gas stream. This process can be seen in the photographs Dr. Garside and his colleagues have recently produced (3, 4). As a result of these eddies the air is " stirred into " the gas and the combined gas and air move forward, getting ever slower and more bulky. As shown in the diagram, there is a cone of pure gas in laminar flow at the base of the jet. This only extends some four diameters but beyond this point the maximum gas concentration will still occur at the axis of the stream. The outer boundary of the jet marked by the presence of only a small amount of town gas, subtends an angle of about 12 degrees to the axis (4, 5).

Up to this point the behaviour is similar for a jet pointing into a burner or a jet discharging into free air. Evidently if the jet were to continue in this way indefinitely, a very large amount of air would be entrained, but the velocity would drop nearly to zero and it would then be difficult to utilize the heating power of the gas. In order to burn the gas satisfactorily it is necessary to interrupt the air-accumulating process whilst there is still sufficient kinetic energy left in the stream to enable it to be conveyed to the point where it is to be burnt and there to force it through the flame ports at sufficiently high velocity to give a stable flame.

It is thus the main function of the burner throat to arrest air entrainment, and the main function of the burner tube to convey the resultant mixture to the burner head with as little energy-loss as possible. It is usual for the burner tube to open out again beyond the throat; this, by reducing the velocity-head and increasing the pressure-head makes it much easier to distribute the gas evenly among the flame ports. This expansion of the tube should be done in such a way as to cause the least possible energy loss, and on this account an angle of 3° with the axis of the tube is desirable. This is unfortunately not always possible in a short burner.

Lighting Back

Referring again to Fig. 2, it will be seen that a " region within which flame would be possible " has been sketched in. Evidently, flame is not possible at the centre, for there is too little air, while at the boundary of the jet there will be too little gas. Flame travels fastest in a mixture of about 20% gas, 80% air, and it may be assumed that it is in the region where this mixture is to be found that the flame is most likely to form if the injector is accidentally ignited. The burning gases are, of course, being carried forward with the rest of the stream, and if the velocity at this point is faster than the rate of flame propogation through the mixture the flame will vanish. Commonly, however, this is not the case, and a stable shell of flame is able to establish itself, the newly-formed air-gas mixture near the orifice (say, at point P) being continually ignited by flame which has travelled back from a point further " downstream " (say, point Q).

Ignition at the injector can come about in two ways, either by way of the air-ports or by way of the burner tube.

(*a*) *Ignition through air ports.* This may take place simply as the result of the careless holding of a flame in too close proximity to the air ports. Probably more often, however, ignition is the direct result of the lighting-up explosion wave. For example, a kettle which is placed over a short-shanked hotplate burner before the gas is turned on, causes a quantity of explosive mixture to accumulate round the burner and air port when the tap is turned on. A moment's delay in applying the light may then cause the burner to light back, even though

* Communicated by the Watson House Research Department of the Gas Light and Coke Company.

† The terminology used throughout is shown in Fig. 1.

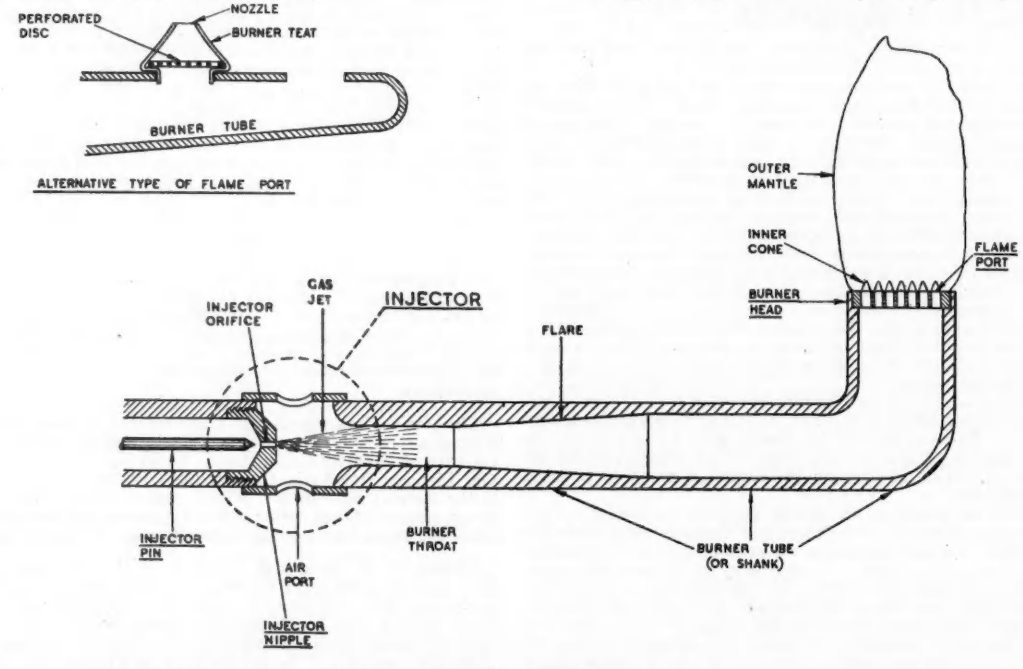

Fig. 1

the match is not put near the air-port. A similar situation can easily arise in some street-lamps if the ignition is somewhat delayed. The air-gas mixture fills the globe, and the flame spreading through the mixture is projected through the holes round the periphery of the inner reflector, and so into the air ports.

(*b*) *Ignition through burner tube.* Flames may also reach the injector through the bore of the burner tube. As has often been stated (6) the existence of a stable flame at the burner head depends on the ratio of the linear rate of efflux to the speed of flame in that particular mixture. In general, the velocity of efflux should be at least double the flame speed. Even in the other parts of the burner the mixture velocity is usually as great or greater than the flame velocity, so that under stable, balanced conditions it should be impossible for the flame to travel back to the injector. Such an event may happen, however, on first lighting a burner, when the aeration —and in consequence the flame velocity—is likely to be exceptionally high due to admixture with air momentarily caught in the burner.

Ignition through the burner tube may also be possible if the gas pressure is suddenly reduced by the turning down of the tap, so that the velocity of efflux is lowered before the corresponding fall in air-gas ratio has had time to take place. In some cases, this may even take place when the burner is turned down gradually.

The Burner Head

So far we have been considering the conditions which exist in a burner which has lit-back to the injector. It is necessary now to discuss for a moment, the burner in its normal state, with the flame burning healthily on the flame ports. From these ports a stream of air-gas mixture is proceeding, and the effect of bringing near a source of ignition—say, a spark of white hot metal from a "flint" lighter—is to cause a flame front to travel through the mixture surrounding the ports until it envelopes each column of mixed gases and reaches equilibrium in the conical surface which is familiar a feature of the aerated flame. W. E. Benton (6) has suggested the ingenious simile of a shoal of fish trying to swim out of a lake into a river which empties out into it. The river flows faster than the fish can swim, so that before they reach the actual river they are stationary, although still swimming hard against the current. The line which the fishes form corresponds to the inner cone of the bunsen flame.

From this it is clear that the height of a bunsen cone depends on two factors; increase in efflux velocity of the mixture (*i.e.*, speed of the river) lengthens the cone, whilst increase in speed of flame propogation (*i.e.*, speed of the fishes) shortens it. The speed of flame propogation depends largely on the ratio of air to gas in the mixture, and if this is higher than usual there is a corresponding rise in flame speed and a consequent tendency to light back unless higher mixture speeds are employed. The use of higher mixture speeds is not the only way of preventing lighting-back, however; one can design a burner head with small holes or slots so that it is "flame-proof."

Reverting to the simile of the fishes trying to swim up the river, one may compare the flame-proof burner head to a net stretched from bank to bank. Then, no matter how slowly the river flows, the fish will be unable to get beyond the net, and similarly with the flame-proof burner head a stable flame can be obtained with high flame velocity and low velocity of efflux. This matter will be considered in more detail in the third article of this series.

The Partial Light-back

We have excluded from consideration so far the case of the flame which travels part of the way from the flame port towards the injector but is arrested by a gauze or perforated disc at which a stable burning condition is set up. This is a trouble which assumes particular importance in gas fires and street lamps, where it is made worse by the fact that the same nozzle will often fire back again if the burner is turned out and relit. This is due to the fact that the one disc which is hotter than the rest opposes in consequence a higher resistance to the air-gas mixture, so that the velocity of efflux is temporarily reduced and the nozzle lights back once again.

The simple solution is for the designer to avoid such flame-traps wherever possible, and it is doubtful if they are ever really necessary. They have usually been inserted with the object of improving mixing, but the only real effect they have is to reduce the size of eddies in the stream caused by bends or other irregularities at some point nearer the injector. This is a useful function, leading to a reduction in flame noise and increased flame stability, but it can usually be achieved with less pressure loss and without the other attendant disadvantages by longitudinal finning in a parallel-sided channel. This has been done in the "channel-grid" nozzle used in some domestic lighting burners. It is hardly necessary to mention that, quite apart from this such gauzes and discs have serious disadvantages as traps for fluff and dust which is liable to deposit on the small holes and choke the burner.

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The second article of this series will be entitled "The Stability of Flame at an Injector," and will discuss methods of making injectors self-extinguishing.

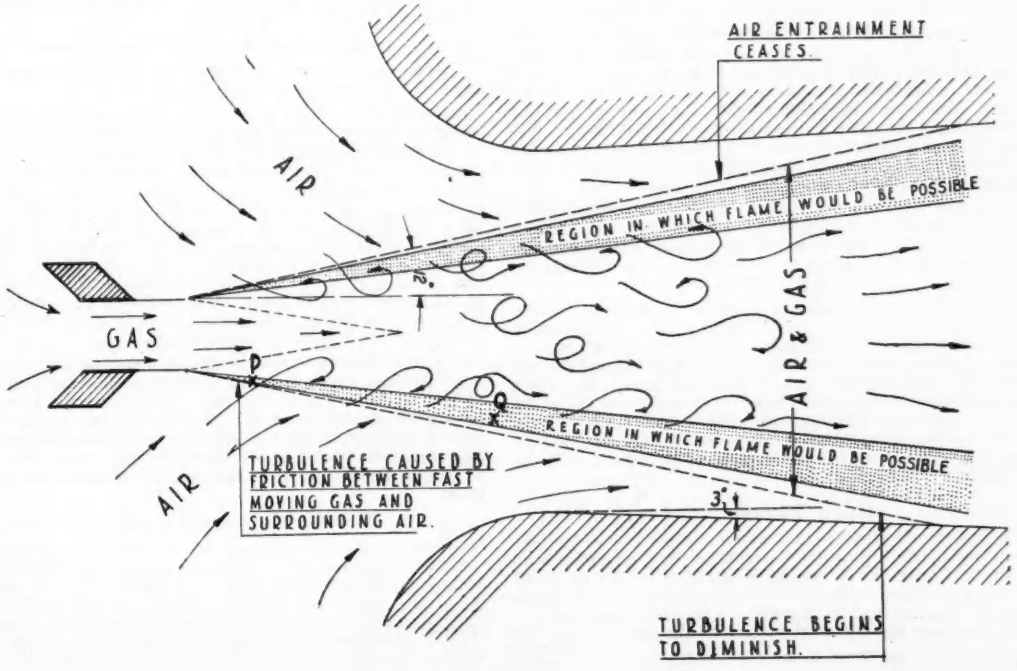


Fig. 2

Commercial Uses for Gas*

Baking — Fish Frying — Hotels and Restaurants

By W. JOHNSON and W. F. MOORE,
Wandsworth and District Gas Company

BAKING

Potential Load

THE annual consumption of bread per head of population in normal times was about ½ lb. per day. In the Wandsworth Gas Company's area, with an estimated population of 1 mill., the daily bread consumption is 500,000 lb. Assuming that 1 sack of flour (280 lb.), together with the necessary water, yeast, &c., produces 380 lb. of bread, 500,000 lb. require 1,316 sacks of flour. If we take an efficient bakery using gas-fired ovens as consuming—

	Therms per Sack
Bread baking	3.0
Hot water	0.2
Steam and other uses	0.3
Total	3.5

then the daily potential load for baking is 4,606 therms. This means an annual load of 1,681,000 therms, or 1.68 therms per year per head of the population. The present gas consumption for baking in our area is 90,850 therms per annum.

Trends of Baking Trade

The two major developments in the baking trade are the abolition of night baking and the growth of large-scale bakeries.

Night Baking.—The abolition of night baking, combined with higher labour costs and general labour shortage, means that bakers are facing completely changed conditions. The small baker who used his oven at night for bread baking, and in the day for small goods, is faced with a very serious position. He can no longer handle his trade with one oven nor with a set of ovens, even if he has working room for the confectioner and the baker at one time. His choice is either to contract out one of these processes or to find room for more ovens. In London, where the small baker is still the major supplier, and has built his goodwill on his own bread, he will, if he is to survive, go to great lengths to continue his own baking. It is also certain that he will try to continue to bake his own small goods. The result is, that with the usual limited space available, he will have to sacrifice his fuel space, and that means that he will have to install a gas or an electric oven to supplement or to replace his existing ovens. Higher wage costs and the general shortage of skilled labour means that he must use his labour more effectively; he can do so, if he can save time in stoking by converting his solid-fuel fired oven to gas-firing.

Large-scale Bakeries.—Unlike in the North of England, the large wholesale baker has not been the main producer in London. However, his grasp of the market is growing rapidly, the most favourable factor being the more economical use of labour, by the greater use of mechanical aids. While the small baker is limited by the size of premises attached to his shop, the large baker builds his bakery preferably in a side road, and plans for plenty of space. Although, therefore, he has complete freedom of choice of fuels, nobody is more appreciative of the labour-saving qualities of gas.

Thus we can say that the conservatism of the " street-corner " baker will be broken by force of circumstances, with greater opportunities for the use of gas. Also, the growth of large bakeries increases our opportunity, because of the preference shown by large bakeries for labour-saving fuels.

The war period also has contributed openings for gas sales. There has been very little opportunity to carry out regular maintenance, and in London large numbers of underground ovens suffered damage by enemy action. Consequently, many ovens, which in normal circumstances would have given many years of life, must be rebuilt. There will be tremendous activity in oven building over the next 10 years. The present time presents a great opportunity to secure this valuable potential load, provided we offer attractive tariffs, and maintenance is necessary. The baker, on his part, is anxious to use gas if he can be persuaded that the cost is reasonable.

Oven Design

The three basic types of ovens in common use are:—

Side-flue Oven.—This is probably the most common type of oven in use in South-East England. Its design is as old as the art of bread making, being a solid brick-built chamber directly fired—*i.e.*, the baking chamber is also the combustion chamber. The furnace is placed for convenience at either the left or right side of the oven door. The method of operation is to fire the oven to a high temperature, remove the fire, clean the oven to remove soot, and then use the stored heat for baking. In spite of the intermittent character of the operation, and the obvious thermal inefficiency, it has its firm advocates: some bakers assert that bread tastes sweeter when baked in this type of oven than in any other. (The wise salesman never contradicts such statements.)

Hot-air Oven.—This type of oven is not very popular among bakers. The heat is applied directly to the outside of the baking chamber. It resembles a muffle furnace, in that the heating medium is usually placed beneath the baking chamber, and the hot gases pass around the sides and top of the oven. It may be fired with solid fuel or gas. The thermal efficiency is higher than that of the side-flue oven, but its baking properties are not as highly rated, though it gives continuous baking. In spite of these remarks, some of the more efficient and successful gas-fired ovens operate on this principle.

Steam-tube Oven.—The steam-tube oven allows for continuous baking. Heat is obtained by using steam tubes in the oven chamber. Numerous sealed tubes, containing small quantities of water, are arranged in banks along the roof space and under the sole of the oven. These tubes project into a combustion space at the back or side of the oven, where they can be heated by coke, gas, or oil. The application of heat vaporizes the water and fills the tubes with steam at very high pressures. There are various arrangements of these tubes; some project in horizontal lines into the furnace chamber, while others are concentrated in a small fire-box. Some degree of control is effected by altering the distance the tubes project into the combustion space; thus, tubes nearest the heat, in the case of coke firing, have a smaller area exposed than those higher up the fire-box. Considerable practical experience and skill have gone into the design of the steam tubes, and the result is a high degree of temperature uniformity within the oven. The thermal efficiency of this method of heating is comparatively high.

Gas Firing of Bakers' Ovens

Ovens specially designed for gas firing are of the hot-air and steam-tube types. It is, however, practicable to convert any of the three basic types of ovens to gas from solid fuel, and the results are very satisfactory. When a review was made, before the war, of the prospects of converting the baking trade to the use of gas, it was obvious for many reasons that the best line of action was to convert existing ovens. The most important factor is the life of an oven, say about 20 years. The conversion of existing ovens is still of first importance.

Conversion of Existing Ovens

A great deal has been published on this subject, and we propose merely to summarize the more important facts.

Side-flue Oven.—This conversion is very simple, the fire-box door being replaced by a fire-brick-lined plate with a small firing hole of about 2½ in. diameter in the centre. The burner is a simple nozzle burner using neat gas. The burner is positioned just outside the firing hole, and fires through the hole into the fire-box. It is not necessary to make any alteration to the flue, for example, to provide a flue break, but it is essential to see that the existing damper is effective, and to fit a safety control on the gas supply to prevent opening of the main cock before the pilot, and turning on of the gas with the damper shut. The effectiveness of this type of conversion depends in the first place on the condition of the oven. The brickwork must be in sound condition and the flue must be good. Given a good oven, final success depends on the manner in which it is used.

It follows that with an oven of low thermal efficiency, such as the side-flue oven, the bulk of the fuel goes to heat the oven or the flue rather than in useful work. Hence the greater the amount of work passing through the oven, the lower will be the cost per sack baked, until a condition is reached when the oven is nearing its maximum capacity. Our results before the war showed that a weekly sackage of not less than 20 per oven was desirable if reasonable costs were to result.

TABLE 1.—*Consumption for Side-flue Ovens*

Shop	Weekly Average (Sacks)	List Period (Year)	Average Consumption per Sack (Therms)
A	30	1	3.5
B	12	1	5.2
C	21	3	4.1
D*	45	1	3.5
E	17	1	4.8

*Twin-deck side-flue oven.

* From Communication No. 297 of the Institution of Gas Engineers; presented June, 1946.

With 20 sacks per week, gas consumption varies from 4 to 4.5 therms per sack. The cost of conversion in 1938 averaged £25, exclusive of gas supplies.

Steam-tube Oven.—There have been several methods of conversion used with this type of oven, depending in the first instance on tube arrangement. When the tubes project in single horizontal lines it is quite satisfactory to heat each row separately with a bar burner consisting of a row of Bray industrial jets, so that each tube receives the same amount of heat. Care must be taken to pass the air for combustion over the burner tube to prevent cracking the gas ; otherwise maintenance of the burner is troublesome. Some companies have suggested that the tubes should be protected from the burners by a carborundum tile, or similar device, but we have not had a single case of tube failure due to direct heating. Alterations to the original flues are necessary, because the flue area is greater for coke firing than is required for gas firing. The need to alter the flue size gives an opportunity to replace the usual firebrick with refractory-insulating bricks. Where the tubes are concentrated in two or more rows in a small fire-box, a satisfactory conversion can be made by using a single burner. Once again some alterations to the flues and insulation of the back wall are necessary. The cost of converting the steam-tube oven varied in 1938 from £60 to £120, depending on the oven size.

From the brief description given of this type of conversion, it will be realized that it is a job requiring practical experience of oven design. For this reason alone, apart from the necessity of working with a bakery engineer, it is advisable to give the oven builder the opportunity to make the conversion. Results obtained from a well-designed conversion compare favourably with an oven specially designed for gas firing. While output is a factor in costs, it has not the same importance as with side-flue ovens. It is possible to get results of 3 to 3.5 therms per sack with a modest output.

Hot-air Ovens.—These ovens can be converted either by firing into the combustion chamber with a single nozzle burner or by substituting a manifold burner placed in the firing box.

A number of bakery engineers now list ovens designed for gas firing, and their performances are very good. Future development of gas ovens can afford to break away from the traditional brick-built types. It is possible to design a sheet-steel cased oven which is simpler to erect, and gives results equal to the older types. It gives the bakery engineer an opportunity to place on the market a neat installation, by using vitreous enamelled sheets. It should also be possible to conceal piping and other fittings, to give clean lines.

Baking Process

Bread is made from a mixture of flour, water, and small quantities of yeast, salt, and malt. The proportions which go to make white bread are generally:—

TABLE 2.—*Constituents of Bread*

Ingredients	By weight (%)
Flour	63.6
Water	34.0
Yeast	0.7
Salt	1.0
Malt	0.7
	100.0

A sack of flour weighing 280 lb. gives a batch of dough weighing about 440 lb. The baker scales off the dough at 2¾ lb. for each 2 lb. loaf, thus giving 376 to 384 lb. of bread per sack of flour.

When making the dough, water is added at about 85° F. This is suitably drawn from a storage tank marked in gallons, and called the "tempering tank." The complete mixture is handled in the dough-mixing machine and transferred to a trough, where it is allowed to "stand" to permit fermentation processes to proceed. The dough should be maintained at 80° F. for about four hours, and is usually worked three times by hand during this time, to facilitate the fermentation process. In large bakeries air-conditioning is commonly used in the dough-room. Loss of weight by evaporation up to 5% can take place if humidity is low, but with air-conditioning this figure may not exceed 0.5%. Accurate fermentation can be obtained only by controlling atmospheric temperature. The dough, when scaled and shaped, is proved for 15 to 20 min., and finally fed into the oven, which is set at about 480° F. Baking time varies from 35 min. according to the type of loaf being baked—*e.g.*, tinned bread is given a longer time than cottage bread, and brown bread takes longer than white to bake.

Ancillary Uses for Gas

Mention has been made of the need for hot water and air-conditioning in dough mixing. These provide a useful additional load in gas consumption. Gas is also used for steam raising, and the well-known "Thermspray" boiler is very popular in our area. The use of steam to give colour to the loaf is regional in its demand. Certainly in London there is a strong preference for this finish. Sundry rings are in constant use for a variety of purposes, particularly if confectionery is made in the same bakehouse.

Controls

Thermostatic control does not appear to have any great advantages, and provided the gas controls are easily accessible, preferably at the working side of the oven, the baker can work quite satisfactorily with a temperature indicator. We would, however, recommend the use of a thermostat as a safety measure to prevent the oven exceeding a suitable maximum temperature.

Maintenance

The bakery engineer will usually arrange a very efficient maintenance service with the baker, and this should be encouraged. There is no objection, however, to the gas company undertaking burner maintenance, and steam-boiler cleaning. The main point is that the gas company should make it its duty to see that some maintenance scheme is in force for keeping the gas burners in good order.

Baking Costs

The first consideration is the cost of fuel. In 1938 we considered that the price per therm should not exceed 5d. To-day we charge 8d. per therm, with a small standing charge. Average gas consumptions for various types of ovens (bread baking only) are as follows:—

TABLE 3.—*Oven Gas Consumption*

Type of Oven	Average (Therms per Sack)
Side-flue ...	4 to 5
Steam-tube ...	2 to 3.5 (According to size and usage)

In 1938 our figures in reasonably equal circumstances gave the following comparison of costs:—

TABLE 4.—*Comparison of Fuel Costs*

Type of Oven	Cost per Sack		
	Gas	Solid Fuel	Oil
	s. d.	s. d.	s. d.
Side-flue	1 10	1 2	1 8
Steam-tube	1 3	11	—

No credit has been taken for labour or space saving.

The baker differs from most traders, in that his main raw material, flour is sold at a fixed price, which in turn determines the selling price of bread. This price has legal force and, consequently, a baker must make his profit within fixed points. In 1938 the gross profit per sack was 31s. This did not include delivery costs and general overhead charges. It will be seen that, provided present-day costs are on a comparable basis, the case for gas should be attractive to the baker.

Load Factor

The average quarterly consumption of gas for bakers in the Wandsworth and District Gas Company's area is as follows:—

TABLE 5.—*Bakers' Average Quarterly Gas Consumption*

No. of Bakers	Therms			
	1st quarter	2nd quarter	3rd quarter	4th quarter
17	1,429	1,360	1,194	1,363

It will be seen that the quarterly demand is constant.

The peak load consequent upon the abolition of night baking will be early morning, except on Sunday, the bakery demand falling with the rise in the general demand of the district from 8 a.m. The demand is not adversely affected (it even tends to rise in bad times) by trade cycles. The Gas Industry thus has an opportunity to gain a large load which would improve the manufacturing and distribution demand, and is constant in all conditions of trade.

FISH FRYING

Potential Load

The demand for fish fryers varies in different parts of the country. We have heard it stated that, in Hull, 1,000 people can support one shop. Our local traders endeavour to restrict the opening of new shops to a density of 4,000 head of population per shop. It is probable that the latter figure creates some scarcity, while there is little doubt that the first figure is excessive. The demand per head of population depends mainly on the habits of local people. There is no doubt that a higher percentage of people habitually use fried-fish shops in Hull than in Wandsworth. It is possible, therefore, that the figure of 4,000 is all the trade will stand at the moment, but it is also probable that trade may develop to justify a concentration of one shop per 3,000 head of population. Taking a maximum density of 3,000 persons to one fish shop, this would allow 333 shops in the Wandsworth and District Gas Company's area of supply.

In pre-war years we found that the average cost of gas varied between 7d. to 1s. for every 20s. taken over the counter, when gas was sold at about 7.6d. per therm, with the majority giving figures around 9d. per 20s. taken. The variations were due to the amount of trade and the

size of portions served. The average consumption per shop is 1,600 therms per annum for the 71 all-gas ranges in the area. We can assume, therefore, that the gross average takings per shop in normal times is about £1,350 per year, which seems to us to be a reasonable figure. Assuming that the gross takings of £1,350 could be maintained for the maximum number of shops (333), it would mean that the total business takings would reach the sum of £450,000 approximately, or 9s. per year per head of population—*i.e.*, 2d. per week, which figure seems to be attainable. The total number of fish-frying shops in the area is 127, of which 71 are completely gas fired, the remainder using breeze with one gas-fired pan. The total consumption of the gas ranges is 113,600 therms per annum. The potential consumption is $1,600 \times 333 = 532,800$ therms per annum, an increase of 4.7 times the present consumption. The potential consumption per head of population is equal to 0.53 therms per annum.

Trends of Trade

As far as Southern England is concerned this trade expanded rapidly between the two wars. In our own area, the number of shops increased threefold, and saturation point had not been reached. Prospects for the future appear to point to further development. Favourable factors are the growth of habit of communal feeding, increasing appreciation of the food value of this appetizing dish, and its comparative cheapness. Adverse factors are, first, that the trade is (quite unfairly) classified as an offensive trade. With modern, gas-fired ranges, adequate ventilation, and use of suitable fats, this trade is no more obnoxious than the normal restaurant. Second, there is a strong movement among fish fryers to prevent undue expansion of the number of shops. This is sound in so far as it prevents the number of new premises from exceeding the growth of demand, but it would be a short-sighted policy if it led to congestion in the existing shops. Third, there is, in the London area, still a strong feeling that it is not the " done " thing to patronize fried-fish shops, but war food shortages have done much to kill this idea. Proper siting and accommodation are the best answer to this attitude—*i.e.*, the right type of shop in the right position.

The fish fryers recognize two distinct types of businesses:—

(1) The main-street fish restaurant, well-fitted, attractive, and with comfortable seating accommodation.
(2) The back-street shop.

The former depends for its trade mainly on passers-by, and the latter tends to have a regular clientele. The former type is suitable for any neighbourhood, while the latter is usually confined to districts with a high concentration of small houses.

We have discussed this apparently irrelevant subject at some length because it illustrates the need of gas salesmen to understand trade trends. If one has this knowledge, one knows the fryer's problems and can more easily win his confidence: it is possible to advise with more assurance. One knows that the main-street shop must be equipped for fast service, but that there are other gas uses (*e.g.*, the preparation of hot beverages), that the range could be of a higher quality. On the other hand, one knows that the back-street shop works on a lower margin of profit, through giving bigger portions, that it probably cannot afford elaborate equipment, and that it probably has no sale for hot beverages. In other words, one understands the market.

Range Design

Fish-range design has gone through well-defined stages of development. The earlier ranges were brick-built, coal fired, and decorated with small tiles. The fire-box was lined with good quality firebrick, and the heat capacity was high. The early gas-fired ranges followed this design, but it was soon discovered that the heavy brick setting was a disadvantage. Consequently, design swung over to the other extreme, of a metal box with practically no insulation, but often with elaborate sheet metal and glass decoration. The better type of modern range is quieter in decoration, and the pan is properly housed in a brick setting using insulating-refractory bricks with minimum heat capacity and maximum insulation. Flue-ways are properly designed to give the longest possible travel of the heat in contact with the pan. The pan may have a studded bottom, or ribs, to increase the heating surface. Efficient atmospheric burners with gas and air controls have been on the market for many years. The average thermal efficiency of a well-designed range is of the order of 50%.

Future developments will include greater use of " neat " gas flames firing from the front through ribbed pans with properly proportioned air inlets and flue sizes. For the quick type of trade we see a great future for air-blast burners with automatic mixture control, or burners designed on the principle of the " Chef " burner used in hotel cooking ranges. Suggestions have been put forward for heating by internal tubes. In fact, some American range makers list internal tube-heated pans. Such a development might give 10% increased efficiency. In this case, however, increased thermal efficiency may not mean greater practical efficiency, due to the large amounts of fat to be heated.

Ventilation

The ideal method of ventilation is to remove the products of combustion by one flue and to remove cooking odours by a second flue, using mechanical extraction. The " steam " should be removed at about pan level, and generally higher extract speeds are needed than have often been used. Consideration should also be given to condensing the " steam " fumes in order to reduce the smell nuisance to surrounding buildings.

Thermostatic control is unnecessary except for limit controls, but temperature indicators of the distance type are essential. This is particularly important when mechanical ventilation is installed. The proper temperature for frying is very close to the decomposition temperature of the fat, and the experienced fryer judges the correct temperature by the haze over the fat, caused by slight decomposition. With proper ventilation this haze is removed, with consequent risk of overheating; hence the need for a thermometer.

Types of Range

There are four types of fish-frying ranges in use. They are:—

(1) Wall type range, placed against a wall, the fryer working with his back to the customer.
(2) Service range, with the frying section divided by a partition from the serving counter, the fryer passing cooked food into serving boxes behind the waiters.
(3) Counter ranges, with the fryer facing customers, and serving direct; and
(4) Window ranges, which, as the name implies, are placed in shop windows.

The wall type range is the most common and is practically universal in back-street shops. It may be replaced by the counter range to advantage. Service ranges are more suitable for main-street shops. The appeal of the shop-window range is its advertisement value, but it does not lend itself to good shop lay-out. The appeal, which is a real one, of letting people see the food cooked, is equally well served by service or counter ranges.

Other Fuels

The main fuels competing against gas are coke breeze, and electricity.

Breeze Ranges

(i) Speed.—Breeze ranges are claimed to be faster. (An air-blast burner will surpass the speed of the breeze range.)
(ii) Control with breeze is a matter of fine judgment, while with gas it is simple. With breeze there is a possibility to increase fat losses.
(iii) Cleanliness and Convenience.—Solid fuels are not as clean as gas, and time must be spent on firing and cleaning which could more profitably be employed on production work.
(iv) Cost.—Breeze is cheaper in fuel cost, but if full allowance be given for labour saving and ease of control, it is little different from that of gas. This is particularly true of the main-street shop employing a number of assistants. Fuel cost is, however, of first importance in the back-street shop, when the few pence saved per £1 received helps an already strained balance-sheet. It is difficult to give exact figures for breeze, but some fryers claimed to get down to 5d. for fuel per £1 taken. On an average basis of £1,350 takings per shop, this equals £22 10s. per year —not much payment for the extra work involved.

Electric Ranges

(i) Speed.—Early electric ranges were too slow, but the modern electric range is more heavily loaded and, except for initial heating, compares in performance with ranges fired by natural draught burners.
(ii) Control.—Electric ranges are heavily lagged to conserve heat, but this can be a grave disadvantage. A sudden rush of trade followed by an equally sudden lull (not an uncommon thing in normal times), means that food must be cooked to remove surplus heat, when demand has passed. On the other hand, a gas-fired range can be turned down in similar circumstances with safety. Control is, therefore, inferior to that of the gas range.
(iii) Cleanliness and Convenience.—These factors are about equal.
(iv) Cost.—Using pre-war figures, gas at 9d. per therm was comparable with electricity at ½d. per unit.

Fish Fryers and the Load Factor

Our Company's records show the following consumptions:—

TABLE 6.—*Fish Fryers' Average Quarterly Gas Consumption*

Fish Fryers using All-gas Ranges only	Therms 1st quarter	2nd quarter	3rd quarter	4th quarter
71	409	430	352	410

This trade is one of the more constant users we have over the year, and is little affected by trade cycles. In normal times the biggest demand occurs between 9 to 11 p.m., with smaller peaks at lunch time (Sundays excepted), and early evening (6 to 7 p.m.). It is,

therefore, a favourable load both to the manufacturing and distribution demand costs.

Promotional Tariffs

The claim to discount terms can be substantiated on three grounds: that average consumption is high and should affect consumer cost; that the high summer loads reduce manufacturing cost; and that off-peak demand favours distribution costs.

Fish frying provides a very good example of a case in which a trade tariff should be used. For promotion of business it is better to create a tariff which gives a reasonable discount at all consumptions, than to base discount on consumption. Thus each fryer, irrespective of consumption, pays approximately the same price. The sliding-scale discount based on increased discount for increasing consumption tends to alienate the back-street shop with its low profit margin, while the big main-street restaurant is given very favourable terms for a fuel which would almost invariably be preferred.

Given a competitive tariff for fuel, an efficient maintenance service is the biggest factor in holding the gas load. We consider that the minimum service to be offered should be quarterly cleaning of burners and adjustment of taps, &c., and annual inspection of flue-ways and cleaning of pan bottoms.

Maintenance service of this type usually involves ancillary repairs, since the annual overhaul often reveals defects which require immediate attention, and ready access to the resources of an engineering workshop for brazing, welding, or sheet metal work. This service could be recovered by a direct charge, or included in a service charge where a two-part tariff is adopted.

The Company's terms for this trade are as follows:—

Flat-rate Discount of 15%

This was the original tariff, but it suffered from one disadvantage. The standard price varied in pre-war days in area limits from 8d. per therm in Wandsworth limits, to 13.2d. in the Leatherhead limits. Thus the net price charged varied from 6.8d. to 11.22d. per therm. We assumed, before the war, that the price of gas should not exceed 9d. per therm to compete with electricity, which was making progress as a competitive fuel.

Optional Two-part Tariff

It was decided early in 1939 to introduce a two-part tariff which would help to even out these differences and give as low a commodity rate as possible. The standing charge was made up of three items:—

(i) Differential Charge.—This was arranged to recover the full rate ruling in each of the limits of supply on the first 100 therms per pan per quarter; thus this charge was higher in Leatherhead (13.2d.) than in Wandsworth (8d.). The balance of consumption was charged at the same commodity rate of 7d. per therm for all limits.

(ii) Meter Rental.—This charge was standardized at a fixed amount per pan. Thus, a 2-pan range paid 4s. 6d. meter rental and a 3-pan range 6s. 9d., a "400" or "700" meter being normally fixed for 2-pan or 3-pan ranges respectively.

(iii) Maintenance on the lines already mentioned, and calculated on the estimated cost of labour, was also charged proportionately per pan. Cost of materials used was charged extra to the tariff.

The standing charge is payable monthly, and in advance.

HOTELS AND RESTAURANTS

Trends of Trade

The war period brought about a big increase in communal feeding, and restaurants and hotels open to the public all show increased consumption since 1939. This is the inevitable result of rationing, coupled with the fact that feeding-out has not required the surrender of food coupons. It seems reasonable to assume that when rationing ceases the business of hotels and restaurants will show some decline. We are of the opinion that this process will be slow, and that the final position will be a bigger turnover than before the war. This is a desirable condition, as communal feeding is more economical in food and fuel usage. If the catering trade also improves its knowledge of the better methods of cooking, and if it can do this better than the housewife, the result should be a better fed and healthier nation, with a lower gross food consumption.

Concerning future trends, the hotels and restaurants provide a fuel load similar to that from domestic cooking. The Gas Industry holds the major portion of the load, and has to defend its position against both solid fuel and electricity. Our success will be measured more by the business we retain than by new business obtained. This is a much more difficult position than fighting for new loads, and we must have competent staffs to advise consumers, and to operate a sound maintenance service. The latter is of particular importance, as it keeps us in constant touch with consumers, and should enable us to know early of proposed changes. The equipment we have to offer is first-rate in performance, convenience, and robustness. In cost we can compete favourably with electricity, but the modern coal range is a serious competitor: our view is that the non-heat-storage type of solid fuel range is the most serious competitor.

In this Company's area we have over 600 hotels and restaurants of all sizes, having seating accommodation generally for from 20 to 100 people at the same time. These figures may seem low (and are very low compared with our big neighbour), but it must be borne in mind that our area is mainly suburban. The average consumption for 613 consumers is 1,450 therms per annum, giving a total consumption of about 880,000 therms per annum. This equals a consumption per head of population of 0.88 therm. These figures do not include British Restaurants. Should the Government decide to increase the number of these restaurants the potential gas consumption would, of course, be mainly at the expense of the domestic load.

Gas Equipment

We consider that the salesman must have a sound knowledge of hotel equipment. This may be limited to essential gas equipment, or may extend to a complete knowledge of kitchen lay-out, machinery, and food service. It is not essential to be able to specify sizes of store-rooms, larders, &c., but the nearer the salesman can go to advising on the complete kitchen equipment, the more valuable he is to the consumer, and that means a better chance of getting business. We propose, therefore, to discuss hotel kitchen and service equipment in some detail.

When dealing with hotels and restaurants there are several important differences to be observed from experience gained in fitting canteens:—

(1) Meals are served over a longer period, with smaller peak demands.

(2) There is greater variety in dishes served; and even more so in normal times.

(3) The demand upon the kitchens is unknown, varies widely, is often sudden and unexpected, and is limited only by the accommodation available.

No hard and fast rules can be laid down for estimating requirements, due to a number of variable factors, but the amount of equipment does depend on the maximum number of meals expected to be served, and it is necessary to have some idea of the quantities of food needed to feed a certain number of people in order to assess correctly the sizes of the various appliances required. Table 7 will serve as a general guide:—

TABLE 7.—*Quantities and Methods of Cooking*

Food	Portions	Boiling	Baking/ Roasting	Steaming	Grilling/ Frying
	Pint				
Soup	¼	×	—	—	—
Gravy	1/10	×	—	—	—
	Oz.				
Fish	6 to 8	×	×	×	×
Meat	6 to 8	×	×	—	×
Vegetables (green)	5	×	—	—	—
Vegetables (roots)	6 to 8	×	—	×	×
Vegetables (roots)	3 to 4	—	×	—	
Puddings	4 to 5	×	×	×	—
Pastry	3 to 4	—	×	—	—
Fruit	3 to 4	×	×	×	—
	Pint				
Custards	1/10	×	—	—	—
Sauces	1/10	×	—	—	—

These quantities are varied according to the number of dishes served per meal.

Cooking Appliances

Ovens

In very large establishments the number of meals demands that the different cooking operations shall be carried out in separate rooms, or sections of the kitchen. In such cases the ovens are allocated for their specific tasks of roasting, baking, and pastry work. In the majority of kitchens these duties are carried out equally well in the conventional "range" type of oven. Allowance must be made for different temperatures and lengths of time required for cooking the various foods, and therefore rarely less than two ovens are provided, with one at least wide enough for the largest roast likely to be dealt with. Direct or externally heated ovens are a matter of preference on the part of the user, and bottom-hinged doors are popular where the door opening does not exceed 18 in. in height. Capacities of ovens for roasting are generally rated at 8 to 10 lb. of meat per cu.ft. of oven space, using the size of door opening and the effective depth for calculation. Where space permits, ovens should be elevated upon stands.

(*To be continued*)

Gas Profit of the Blackburn Gas Department for the year ended Mar. 31 was £44,715, the net amount carried forward being £13,983 against £20,634 a year ago. Total expenditure of £290,029 increased from pre-war by £156,293, and total income of £316,870 increased by £139,143. The net debt was now £76,504 against £176,444 in 1940.

The Annual Report of the Montrose Gas Company states that the quantity of gas manufactured during the past year was 153,741,000 cu.ft., being an increase on the previous year. The accounts, after deducting the usual depreciations, shows a profit of £5,764. This, with £3,009 at credit of profit and loss from last year, leaves £8,773. An interim dividend of 4¼% was paid in January and the Directors recommend a payment of a final dividend of 4¼% (making 8½% for the year), plus a bonus of 1% per share. This absorbs £4,625, leaving £2,023 to be carried forward subject to Directors' fees. Mr. G. W. Kemp has been appointed Secretary in place of Mr. D. M. Macintyre, who acted as Interim Secretary after the death of Mr. John S. Officer.

The Gas Industry in the United States: 1939-1945*

By CLIFFORD E. PAIGE
Past President, American Gas Association

IN America, during the second World War, no bombs fell, and the only guns heard were those used in testing or training, but, as everywhere else, the war caused profound changes affecting every individual aspect of life. Two oceans separated the United States from the scenes of conflict, but that circumstance only heightened its responsibility for mobilizing every resource as effectively as it could in the least possible time. It was an enormously complex and difficult task to convert 140 mill. Americans and their social, economic and industrial organizations from the ways of peace into a nation throwing every ounce of its might into the war. It was a staggering task, but it was accomplished. It had to be.

The American Gas Industry had a role as important as it was unspectacular. Its task was to supply the fuel which, because of its unique adaptability and ease of control, was needed in tremendous quantities in war industries, and at the same time to continue to serve the nearly 19 mill. residential customers (estimated to represent 75 mill. persons) who were dependent on gas for cooking, heating or other vital needs. Its task was to maintain a dependable service of supply in ever increasing volume, with reduced personnel, with virtually no additional equipment, and despite shortages of the coal and oil needed to make gas. Moreover, in some sections of the country gas utilities were faced with the problem of supplying unprecedented and unpredictable demands when householders, lacking the coal or oil they normally used, lit their gas ovens to obtain relief from the cold. The Industry met every demand placed upon it. Its performance won the commendation of high governmental authorities.

Over 20,000,000 Consumers

At the end of 1945, the Industry was serving 20,156,000 customers, the largest number in its history. Of this number, 1,178,000 were industrial and commercial firms. It was these industrial and commercial customers, busy with war production, whose use of gas rose most strikingly during the war. In 1939, before the defence programme was under way, they used 1,074,541 mill. cu.ft. In 1945 their demands mounted to 1,687,885 mill. cu.ft., which represented an increase of 57%. Total gas sales rose from 1,693,847 mill. cu.ft., in 1939, to 2,640,264 mill. cu.ft., in 1945, a gain of 56%.

It is indicative of the soundness and adaptability of the Gas Industry that this tremendous increase in demand was handled with reduced personnel and with very slight rise in capital investment. The needs of the armed services and other forces reduced the number of employees in the Industry from 132,700, in 1939, to only 112,500, in 1944, which meant a reduction in the working force of approximately 15%. This record could not have been made had it not been for the careful planning which was begun even before the outbreak of war in Europe, and which was accelerated as it became apparent that the United States would become involved. Much information was collected, at home and abroad, which was later to prove invaluable to the Industry and to the country's war efforts.

In the early days immediately following the entrance of the United States into the war, intensive study was devoted to devising ways of protecting plant and personnel against bomb damage, and to developing techniques for maintaining service in any emergency which might arise. Close study was made of the methods in use in England, but countless experiments were conducted by individual companies in an effort to adapt those methods to conditions in the United States. Fortunately, the preparations for mitigating the effects of bomb damage were never put to test.

Co-operation with War Production Board

Through the American Gas Association the Industry co-operated closely with the War Production Board, the agency which directed war production and allocation of materials, with the Office of War Utilities; the Petroleum Administrator for War, and all other governmental agencies concerned with common problems. As a result, all activities of the Industry were integrated, and wasteful or inessential uses of critical materials were avoided. Just as in other countries, the United States achieved an all-history record in their mobilization of resources and productivity. Just as in other countries, the marshalling of manpower was outstanding and amazing. The Gas Industry of America made a great contribution to the war effort because of the marvellous participation of the persons in it. Old leaders carried on: new leaders developed almost overnight. Together, by their ingenuity, resourcefulness and courage, they converted a good Industry into a great one.

During the latter part of 1942, it became apparent that the growing demands for gas, especially in war plants, would, in certain critical areas, so reduce the reserve capacity of the gas utilities serving those areas, that preparations should be made to curtail consumption should a cold wave or shortage of other fuels place too great a load on the available production. In recognition of the critical need for gas fuel, the War Production Board issued Orders prohibiting the installation of additional house-heating equipment in various areas, except in instances where undue hardship would otherwise be caused. In addition, the Board, after consulting the Industry, determined the steps to be taken by a given utility to reduce consumption if and when a gas shortage threatened. Briefly, the programme involved an appeal to the public to avoid using gas except for the most necessary purposes, and also a plan for shutting off service to the least essential users. Few utilities found it necessary to take such vigorous measures. In the interest of fuel conservation, the entire Industry joined in an educational campaign aimed at eliminating unnecessary and wasteful uses of gas. In national and local advertizing, in every way possible, the Industry publicized the idea that "Gas Is a Vital War Material—Use it Wisely." Even in those areas where reserves were adequate to meet any conceivable need, companies asked customers to avoid waste. The saving of millions of gallons of oil and enormous tonnages of coal which resulted, in manufactured-gas areas, was recognized by the Office of War Utilities as an outstanding industrial accomplishment.

Manpower shortages due to the drafting of experienced employees into the armed services were met by lengthening the work day or work week, by reading meters, and billing customers, bi-monthly or quarterly instead of monthly as in the past, by simplifying office procedures, and by changes in service schedules to make more effective use of labour, motor-cars and trucks. The co-operation of customers was sought in making minor repairs and adjustments to appliances and in avoiding all unnecessary calls for service. Women were hired where possible. Employees were encouraged to suggest methods by which necessary operation could be conducted more efficiently, and by which unnecessary functions could be eliminated.

Research Pressed Forward

Stimulated by war, the Industry pressed forward those aspects of its research programme which seemed likely to produce results which could be put to immediate use. Manufactured-gas companies conducted extensive investigations aimed at increasing the yield of light oils for war purposes, and studied various oils, including gasoline, for enrichment purposes. Every idea which might lead to increased production with the most plentiful materials was carefully investigated. Likewise, natural-gas companies developed improved methods of underground storage, sought better ways of liquefying and storing gas for winter peaks, and studied ways of conserving gas so as to produce a maximum amount of oil. New meter-repair techniques were developed to conserve tin and other scarce materials. A method was developed for recovering and reclaiming virtually all the solder from condemned meters by immersing the discarded meters in a bath of oil heated to a temperature somewhat above the melting-point of the solder. A meter-washing machine was developed which saved labour and eliminated a decidedly unpleasant task.

In the natural-gas Industry there were many chemical developments which helped to win the war. Natural gas is a rich source of basic materials needed in many processes; *e.g.*, glycerine for high explosives and hydrocarbons for the manufacture of plastics of many kinds.

Gas-appliance manufacturers converted their plants, in whole or in part, to producing impressive quantities of items needed by the armed services, some manufacturing specialized cooking, refrigeration and heating equipment, while others turned out parts for guns, aeroplanes, or other fighting equipment. For all of them the experience gained in mass production and in maintaining uniformity and high standards will be valuable now that they are back in peacetime production.

Mass migrations of people to areas in which war production was centred put a strain on the facilities of many gas companies. The new residents needed gas for cooking, for space-heating, water-heating, and for refrigeration. To guide those concerned with providing housing, the American Gas Association published "A Study of Utility Services for War Housing," which indicated the weights of critical materials needed with various combinations of fuel services in accordance with the Government's War Housing Utilities Standards. This study proved of considerable value.

The American Gas Association Laboratories played a most important role in the war. In peacetime the laboratories conduct research and test appliances for the Industry. When war came the facilities and services of the laboratories were offered to the Government, which promptly assigned to them a number of important projects involving research, development and testing. For the Army Air

* From "The Gas Industry Overseas, 1939-45." Communication No. 299 of the Institution of Gas Engineers.

Forces the laboratories supplied 40,000 automatic oxygen regulators for use in high-altitude aircraft.

Spectacular Achievement

The most spectacular, and by far the most important, achievement of the Industry towards winning the war was in the application of gas and gas equipment to the fabrication of war weapons. Here the Industry brought to bear its experience and knowledge, gained over many years, in supplying the heat and atmospheres needed to turn out more, and better, weapons faster than many had dreamed possible. Gas was used in so many ways in war production that were they merely to be listed they would fill many pages. From stress-relieving the largest gun turrets for the greatest battleships, to performing the most delicate operations in instrument-making, gas was extensively used. Its ease of control, its adaptability to a wide range of conditions, its economy of space, and its usefulness in operations requirng exact control of atmospheres, caused gas to be the preferred fuel in thousands of war plants and in tens of thousands of operations. Moreover, where gas was used, experts in heat application were available to solve the many urgent consequential problems.

The war ended, we are entering a period which offers the American Gas Industry wide opportunities for expansion and, at the same time, threatens it with greater competition than ever before experienced. Competition only challenges us! It puts us on our toes. We have faced it always. We prefer to have it that way. We have a product and a special service which is widely needed. We are confident that we have a programme which will enable us to develop and to go forward rapidly. Our new opportunities grow out of the fact that gas came through the war with a greatly enhanced reputation for dependability and availability. Householders who spent many anxious days wondering whether their dwindling supplies of coal or oil would last until a new delivery was made will not quickly forget that the neighbour with gas heat never had such worry and that if his home were less warm than he would have liked it, that was simply because he was patriotically co-operating with the Government. Moreover, an increasing number of persons is willing to pay a premium for the cleanliness and convenience which gas heat offers, as is evident from the large number of orders being placed in all sections of the country.

Post War Programme

But of far greater significance for the future of the Industry is the energetic, comprehensive programme which the Industry prepared in advance of V-J Day and which is now being put into effect. That programme is built on (*a*) research, and (*b*) promotion. The Industry is planning to spend £1,050,000 on this programme over a three-year period. Of this amount, about £600,000 will be used for advertizing and promotional activities, and about £450,000 for research. No less than eight separate research projects, already under way, aim at improving the performances of gas ranges. These include the use of radiant materials in broilers, the distribution of heat in ovens, and the design of different types of burners. Similarly, much work is being done on improving water heaters, house heaters, perennial air conditioners, and other domestic equipment. In fact, no small part of the entire programme is devoted to providing manufacturers with fundamental data which can be readily utilized toward improvement of appliances. Considerable progress already has been made towards automatic ignition of all burners by a single pilot light; faster radiant broiling; better visibility in ovens; and cooler exterior surfaces.

One of the major projects is concerned with ventilating kitchens so that cooking odours and vapours will be carried outside quickly, before they form deposits on walls and ceilings, or are carried to other rooms. This is a project of equal interest to those engaged in promoting sales of fuel other than gas, for the fuel used has little effect on the quantity of cooking odours and vapours produced, except that gas, being capable of adjustment to low-temperature cooking may be presumed to produce somewhat smaller quantities of objectionable vapours. However, in removing vapours, heat also is controlled and during the warmer months this is much to be desired.

New Freedom Gas Kitchens

The Industry's co-ordinated kitchen programme, being promoted under the heading, "New Freedom Gas Kitchens," has aroused widespread interest and promises to go a long way towards offsetting the attempts of competitors to make inroads on the Industry's basic load—cooking. Moreover, by offering the housewife a kitchen designed to eliminate drudgery, simplify her work, and provide a room which is attractive as well as efficient, the Industry is performing a service which will win the good opinion of millions. In addition to modern, efficient gas ranges and gas refrigerators, the Industry is recommending to the public a complete package kitchen design, to include sink, cabinets, counter-work surfaces, and, in some cases, even a counter-type water heater. Thus, builders and architects are offered an ensemble of the smartest and most efficient kitchen appliances and equipment, already laid out for their convenience.

In the C.P. gas range the Industry has something without a rival—a cooking appliance with a certified performance record. C.P. ranges must meet certain definite standards of performance, which substitute facts for claims. These standards provide a measure by which

(*Concluded on p. 203*)

COMPANY MEETING

Severn Valley Gas Corporation

The twelfth ordinary general meeting of the Severn Valley Gas Corporation, Ltd., was held on July 23, at 15, Moorgate, London, E.C.

Sir LESLIE BOYCE, K.B.E., who presided, said : Gentlemen,—You will be sorry to hear that my presence in the chair at this meeting is due to the serious illness of our Chairman, Major Julian Day. The successful development of the gas undertakings grouped under the control of this company has been due in great measure to his enterprise and sound judgment. I know that you will regret with me the reason for his absence and join me in wishing him an early and complete recovery.

The accounts for the past financial year show that the revenue profit, after meeting all expenditure and providing for income tax amounts to £47,510, compared with £42,657 in 1945. The corporation has, therefore, more than maintained the steady progress and financial stability shown in previous years. As disclosed in the Directors' report, the further sum of £10,000 has been transferred to reserve fund. Although nearly all the subsidiary undertakings carry adequate reserves in their own accounts, it is deemed advisable, especially in present circumstances, to build up a reserve in the accounts of the parent company to meet any contingency that may arise in the future.

The Directors recommend the payment of a final dividend of 2¾% (less tax) on the Ordinary stock, making 5½% (less tax) for the year, and a dividend of 6% (less tax) for the year on the Deferred stock. Similar dividends have been paid each year since 1938. The actual dividends paid by individual undertakings in the Severn Valley group of companies have shown variations during that period, but the global figure received by the parent company each year has enabled its shareholders to receive a stable and satisfactory return on their investment.

The balance carried forward, after allowing for the dividends recommended, will be £28,946, as against £26,245 brought in at the beginning of the year.

The Balance-Sheet

Turning to the balance-sheet, it will be noted that the item Investments in Subsidiary Companies shows an increase of some £4,600. No new subsidiaries have been acquired during the year. The increase, therefore, represents further purchases of shares in companies already controlled by us.

The balance-sheet contains an item which appears this year for the first time—namely, provision for group excess profits tax. Under existing legislation, the parent company and all those subsidiary companies, in which it has an Ordinary share holding of at least 90%, are treated as one E.P.T. group and the parent company is assessed with the group's E.P.T. liability. In turn, the parent company is empowered to collect from members of the group their individual liability. The liability of this group up to March 31, 1945, has now been agreed between our accountants and the Inland Revenue, and this figure, plus the estimated liability for the following year, is now shown in the corporation's balance-sheet.

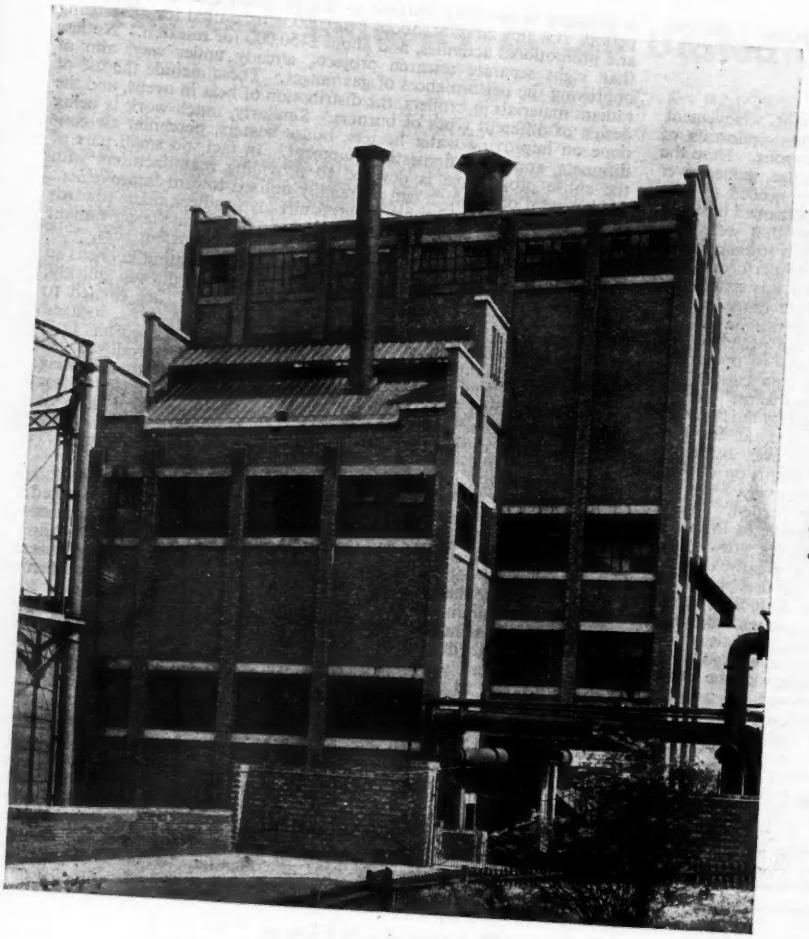
Despite the satisfactory state of the accounts now before you, the past year has not been an easy one. Although the war in the Far East came to an end in August last, our difficulties have not diminished—on the contrary, they have considerably increased.

A Progressive Policy

As a result of the progressive policy pursued by our organization before and during the war, our undertakings as a whole have recorded very substantial increases in the demand for gas. As a natural result of the war, the acute shortage of materials and labour made it impossible for all the necessary extensions of plant to be carried out, in consequence of which some of the existing plants have during the last few years been severely over-taxed.

This Corporation was formed in 1934 with the primary object of co-ordinating the supply of gas on a regional basis. By 1939, we had proved conclusively that this co-ordination brought much benefit to suppliers and consumers alike. Wherever coke oven gas was available at an economic price, we took advantage of this form of supply. A number of small works were closed down, and were supplied in bulk by larger and more efficient undertakings.

By 1945, the undertakings brought into our group had increased their sales of gas by no less than 98%. In comparison with this outstanding example of expansion, the official figure for the increase in



GLOVER-WEST

Vertical Retorts

at

HIGH WYCOMBE

ARCHITECTURAL FEATURES

From the layman's point of view, perhaps the most interesting feature is the attempt to produce in an essentially industrial building a pleasing architectural appearance. The steel frame-work of the building has been encased in brickwork, and the coal-receiving annexe and coke hoppers are built as integral features of the main building. A liberal use has been made of steel-framed windows for producing maximum natural lighting and ventilation. Parapets with "Snowcrete" coping form a pleasing finish to the skyline. Rain-water pipes are not visible, being taken down internally. The full effect of the building when viewed from Desborough Road is masked to some extent by the abutment of the old horizontal retort house, but when this is dismantled and the new retort house extended it will appear as an independent and symmetrically designed structure.

WEST'S

GAS IMPROVEMENT CO., LTD.

Miles Platting, MANCHESTER 10

Telephone: Collyhurst 2961-2-3-4-5.
Telegrams: Stoker, Manchester.

London Office: Columbia House, Aldwych, W.C. 2.

Telephone: Holborn 4108-9.
Telegrams: WESGASCO, ESTRAND.

sales by all undertakings in Great Britain during the comparable period is no more than 19%.

The average price of a ton of coal, including handling charges at the works, at the date of acquisition was 23s.; in 1945 it worked out at 50s., or an increase of 117%. Not only has the price per ton risen very steeply but the quality has deteriorated considerably, thereby reducing the value of the saleable products. Costs of labour and other materials have also shown large increases. Nevertheless, in the Severn Valley group, the average price received per therm of gas sold increased by no more than 10% over the same period: I think you will agree that this remarkable result speaks well for private enterprise.

Disadvantages of State Control

You will expect me to refer to the Government's declaration that the Gas Industry is to be nationalized. That declaration was made more than seven months ago, but no indication has yet been given as to how and to what extent nationalization is expected to benefit either the Industry or the public which it serves. All but the smallest gas undertakings already operate under Parliamentary control. A considerable proportion is already publicly owned. The report of the Heyworth Committee indicated that those operating under private enterprise compare not unfavourably with those under public ownership.

Mr. Herbert Morrison has said that it is the public interest that counts. Some eleven million houses are at present supplied with gas—approximately one for every four men, women and children in the country. The public are, therefore, interested mainly as consumers, and there is no reason to think that they will obtain either cheaper gas or better service in the event of nationalization. One large section of consumers has already declared emphatically against it. The Association of British Chambers of Commerce has issued a report which states that the Gas Industry has been "adaptable to changing conditions, flexible in its attitude, modern in its outlook and progressive in its policy." The same report advocates geographical integration and says: "In our opinion this integration of the Gas Industry can best be effected within itself, without any revolutionary change being necessary. . . . Our view is that under a Government monopoly the consumer will be the ultimate loser."

The British Gas Federation put forward similar views in a report submitted to the Government in 1943. Our own experience is consistent with those views. We have found much scope for integration, particularly among the smaller undertakings. We have put it into practice by carefully worked out evolutionary methods. The figures quoted above are some indication of our success, and of the extent to which the public have responded to our efforts. Comparable results have been achieved by other gas groups, formed like ourselves for the express purpose of integration in the Gas Industry.

Alternative Proposals

In the light of our combined experience, and as a constructive alternative to nationalization, proposals for a concrete programme, designed to guarantee more rapid and complete integration on evolutionary lines, are now being prepared.

Not only is there no indication of future benefit to the consumer from State ownership, its mere shadow has already proved disadvantageous. The great increase in the demand for gas, both during and since the war, the accumulations of normal extensions deferred since 1939, and the development of new housing estates, have created an urgent need for much capital expenditure. By the threat of nationalization the Government have made it impossible to raise new capital on such favourable terms as would otherwise have been possible. They have been asked more than once for an assurance that, if we carry out capital expenditure previously approved by them, there will be no resulting loss to stockholders in the event of nationalization. Such an assurance has not been forthcoming. If the Coal Industry Nationalization Act is followed as a precedent, it seems not unlikely that the greater the immediate development of our industry, the less compensation will be available to Ordinary stockholders.

The Gas Industry, as a whole, has a fine record of service, efficiency, labour conditions and fair prices. It has been developed to a stage beyond which improvement can be achieved only by steps worked out in careful detail by those who understand the industry.

I welcome the statement recently made in Parliament by the Minister of Fuel and Power when he said: "If some of the machinery that can be devised could deliver the goods, I am ready to consider the alternative to nationalization." The British Gas Council have declared against nationalization, and it seems that in this they have the support of the Industry as a whole. That declaration appears to call for a constructive alternative, and the Minister's statement appears to indicate that he would be willing to give it fair consideration.

Plea for Co-ordination

In my view, the issue of State, municipal or company ownership is of secondary importance. In the public interest the far more urgent need is to make good war-time arrears, and to provide for the rapidly increasing demand for gas. This should not be done on parochial lines as in the past. It should be co-ordinated on a long-term basis by sound planning for the future, but this policy is being cramped and discouraged by the threat of nationalization. I invite the Government to give first priority to such co-ordination and to the removal of the obstacles to the raising and expenditure of new capital.

As I have said, the question of national ownership is of secondary importance, but it is perhaps significant that in other parts of the Empire, where the public have had more practical experience of nationalization than in this country, gas has been left under municipal and company ownership. In both Australia and New Zealand, successive Labour Governments have thought it wisest not to attempt to nationalize gas.

Changes in Organization

Consequent upon the ending of the war there have been one or two changes in our organization. First of all, we welcome back Colonels Studholme and Dawnay, who have returned to us after distinguished service in the Army, most of which was rendered overseas in Africa and later in Europe. Colonel Studholme has been appointed to fill a vacancy on the Board and now retires and offers himself for re-election.

On April 1 last, Mr. G. M. Gill, for reasons of health, resigned his position as Managing Director. Mr. Gill has devoted all his energies and his outstanding ability to our organization since its formation, and his success can be measured by our record of steady progress. To have doubled the sale of gas of our undertakings, and to have averaged only a 10% increase in price, in the face of 117% increase in the price of coal, is an achievement of which any managing director may be justifiably proud. Mr. Gill, I am glad to say, will continue to serve as a Director of the Corporation and also as Consulting Engineer.

Next, it gives me great pleasure, on behalf of us all, to offer our heartiest congratulations to Sir George Evetts on his recent knighthood, which he has so richly deserved for his distinguished service to the nation as Gas Adviser to the Ministry of Fuel and Power. His wise counsel has always been of immense value to us, and especially during these last difficult years.

Tribute to Staff

Finally, I should like to thank our General Manager, Mr. R. S. Snelling, and also the staff and other employees, both of our central organization and of all our subsidiary undertakings, for their loyal and energetic co-operation which has enabled these satisfactory results to be put before you.

The report and accounts were unanimously adopted, and the proceedings terminated with a vote of thanks to the Chairman, Sir Leslie Boyce, K.B.E., for presiding.

The Gas Industry in the U.S.A.—*concluded from page 201*

the claims of ranges using other fuels can be compared. They also measure the obsolescence of the older gas ranges in use. The C.P. range, which may be manufactured by any company which will turn out a product measuring up to the standards, ties in effectively with the consumer movement seeking to establish high standards of quality.

In America, there is a wide interest in air conditioning, especially during the summer months when, in most of the States, the weather may be either extremely hot or humid, or both. Probably, there is no new field which offers more promise for the Gas Industry. Shortly before the war, units were available which provided perennial air conditioning, providing heat and humidification in winter and dehumidification and cooling in summer, or any combination during the spring and autumn. When desired, the unit could be used simply to circulate air in the home. Several thousands were placed in use before the war stopped production. They have now been thoroughly tested under actual operating conditions, and it is to be expected that a substantial new load will be added through their widespread use.

In a discussion of the Industry's post-war programme as it had shaped up to 1944, by Ernest R. Acker, then President of the American Gas Association, he wrote:—"The Gas Industry believes there are many fundamental reasons why it can best serve the domestic market:—The quality of service rendered to the customer, the conservation of national resources, employment of labour, basic economies to the customer and the company. In connexion with the latter, there are basic factors which favour gas over its nearest competitor —electricity. These are:—(1) Where heat is desired, from two or three times the useful heat can be transported to a customer in the form of gas from a pound of coal as can be transported in the form of electricity; and therefore, the combination of gas and electric service in the home is to the best interest of society, as well as the conservation of natural resources. (2) Two-thirds of the energy used in a community is in the form of heat and only one-third is in the form of light and power. Hence the eventual economic field of gas is an ever-expanding one. (3) Gas can be stored where electricity can not, which means that we have definite fundamentals in our favour, enabling us to serve short, heavy cooking loads with a minimum of investment, which benefits both the customer and the supplier."

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market

July 29.

Effective July 15 there has been an increase of 5s. per ton in the price fixed by the Coal Tar Controller for COAL TAR PITCH in bulk or solid form for the manufacture of Patent Fuel in the home market.

The price thus becomes 75s. per ton free on rail/road waggon/barge or ship, at Makers' Works.

There are no other changes to be recorded in the prices of Coal Tar products.

The Provinces

July 29.

Average prices of gas-works products: Pitch, 70s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6¾d. per gallon; pure, 3s. 2¼d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by Government Orders. Prices for road tar were increased by a half-penny per gallon by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

Scotland

July 27.

Market shows no alteration with demand exceeding supply. *Refined Tar.** Yield to the Distiller is 5d. per gallon ex works, naked. *Creosote Oil.* Timber preserving quality, *5½d. to 6½d. per gallon; Hydrogenation Oil *5⅞d. per gallon; Low Gravity or Virgin Oil, †7⅛d. to 7½d. per gallon; Benzol Absorbing Oil *6½d. to 8d. per gallon. *Refined Cresylic Acid** is 3s. 6d. to 4s. 6d. per gallon ex works, naked, according to quality. *Crude Naphtha* †7d. to 8d. per gallon. *Solvent Naphtha.** Basic maximum prices delivered in bulk, 90/160 grade, 2s. 10d. per gallon, and 90/190 Heavy Naphtha, Unrectified, 2s.0½d. per gallon; Rectified, 2s. 4d. per gallon. *Pyridine*†, 90/160 grade, 13s. per gallon, and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Such adverse factors as the severe set-back in Wall Street and the decline in coal production militated against any recovery in the Stock markets last week, and apart from Gilt-edged Stocks, which continued firm, prices in most sections drifted downwards. A few specialities in the industrial section moved against the general trend and new issues also attracted attention, otherwise the turnover was small.

The Gas Market was no exception to the prevailing conditions, but it will be seen that although there were few price movements the majority were upwards. Oriental stock was again the feature with a further gain of 15 points to 255, and on support Imperial Continental moved up 5 to 114½. On the other hand, Gas Light units and South-Eastern Gas Corporation ordinary shares both declined. The market now awaits with interest the interim or half-yearly dividend announcements, especially of those companies hard hit during the war and which are now slowly but surely recovering.

The following is the full list of price changes last week:

OFFICIAL LIST.

Assocd. Gas & Water Undertakings	19/6 —21/6	+-/6d
4 p.c. red. cum. pref.		
Croydon 5 p.c. deb.	120—125	+ 2
Gas Light units	21/3 —22/3	- -/3d.
Do. 3½ p.c. max.	86— 89	- 1
Do. 3 p.c. deb.	91—97	- ½
Imperial Continental	112—117	+ 5
Oriental	250—260	+ 15
South Eastern Gas Corpn. ord. ...	19/6 —20/6	- -/6d.
Do. 4½ p.c. red. cum. pref.	20/6 —21/6	+-/6d.
United Kingdom Gas Corpn. ord....	21/9 —22/9	+-/3d.

PROVINCIAL EXCHANGES.

Newcastle units	23/6—24/	+-/6d.

TRADE CARDS

TOM CARRINGTON & CO. LTD.
Lyndon Toolworks, West Bromwich. T/N 0317 (2 lines).
"LYNDON" and "EGA-KUT"
SCREWING TOOLS;
TAPS; DIES; STOCKS AND DIES;
GROUND THREAD TAPS

MAVITTA DRAFTING MACHINES LTD.
Park Road, Aston, Birmingham. T/N Eas 0482. T/A Mavitta, Birmingham.
Machines for all Boards. Perfectly Balan Tables.
ENTIRELY BRITISH.

PECKETT & SONS LTD.
Atlas Locomotive Works, St. George, Bristol 5. T/N Fishponds 53006. T/A Peckett, Bristol. London Representatives: Ferguson & Palmer, 9, Victoria Street, S.W. 1.
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